McLaren V2 - High Speed Power Line Communication Module

User Manual

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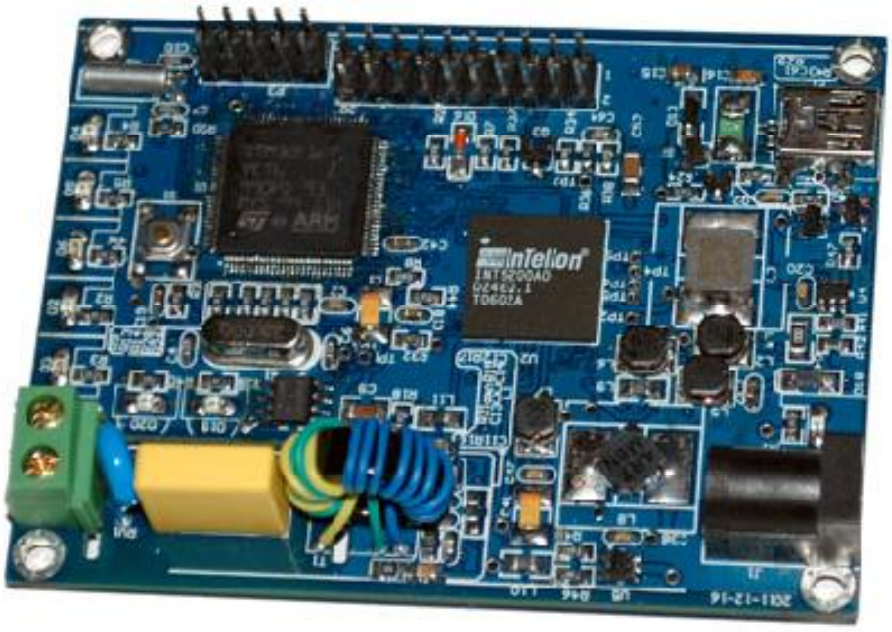
The first chapter. Overview

1.1 Product introduction



This document is to introduce the power line communication module McLaren V2，working in 4.3MHz ~ 20.9MHz band. Use OFDM modulation technology when send data then transmit on the power line. On the receiver side, use filter to capture the modulation signal and demodulation, you will have the original signal. So far,McLaren V2can reach a speed of 5Mbps。

McLaren V2 module use Intellon transceiver INT5200for high speed power line communication modulation and demodulation, to send and recieve data from power line.

By using OFDM(Orthogal Frequency Division Multiplexing),the module can better maintain the performance of the modulation signal.

McLaren V2is designed to transmit serial data through the power line,to replace cable everywhere.

1.2 Product performance

1.2.1 AC & DC power line communication

McLaren V2can work on 230V/50Hz, 110V/60Hz AC power line，and also on 0-400V DC power line.

1.2.2 Transparent Mode，Plug and use

McLaren V2 support transparent mode,that it only transmit data to the end nodes but do not care how it is done.It is all about data delivery in Transparent mode.

Users do not have to worry about lower protocols,you can just plug and use,no other changes on the software side.

1.2.3 HomePlug1.0

McLaren V2 module use INT5200，INT5200 is the first MAC/PHY/AFE power line transceiver in the world that in HomePlug1.0 Standard,is also the replacement for INT51X1. McLaren V2 also has ADC，DAC，AGC，filter and power amplifier.

1.2.4 5Mbps on power line

McLaren V2can reach a speed up to 5Mbps on the power line.

1.2.5 FEC

Using FEC data coding technology,fault detection will be verified by the receiving party.In FEC，the receiving party can not only detect fault,but also where it happened and correct it.So error correction code is needed in FEC.

1.2.6 OFDM

McLaren V2 use OFDM technology，which is the bases of HPA（HomePlue Powerline Alliance）Standard，collect different frequency into one signal and transmit.

The advantage of McLaren V2 is that it seperate multiple digital signal and

transmit around interference signals. Meantime，McLaren V2 monitor any sudden change on the power line.

1.2.7 AT commands for high-end set

Users can be modified by using the AT command McLaren V2 module system parameters, such as baud rate, mode, and so on.

1.2.8 loopback mode

McLaren V2 module system can be configured for normal mode and loopback mode, the output of the data in the normal mode, the module can be received through the serial port; while in loopback mode, the module will received data is then sent to the power line, in two communications module, a module is set to loopback mode, eliminates the need for a serial.

1.2.9 RoHS-certified

McLaren V2 module is RoHS compliant (Restriction of Hazardous Substances).

1.3 Specifications

Product Name	McLaren V2 (Homgplug serial adapter)
Communication interface	3.3V TTL UART RS232 RS485
Communication power line voltage	230V/50HzAC 110V/60Hz AC 0-400V DC
Supply voltage	4.5Vto24V DC，typ 12V/2A DC
Signal modulation	OFDM(orthogonal frequency division multiplexing,，

	Homeplug 1.0 compatible)
Error correction coding	FEC(Forward Error Correction Code)
Powerline communication rate	5Mbps (throughput)
Maximum packet length	300 bytes
Transmission distance	300 feet (without repeaters)
LED indicator	Powerline LED System LED Serial LED

1.4 Applications

- Automatic meter reading (AMR)
- Industrial manufacturing and control
- Access control, fire alarm, smoke alarm
- Acquisition and transmission of instrument data
- Safety monitoring system
- Smart Home
- Solar and wind power systems

The second chapter. Light and pin definition

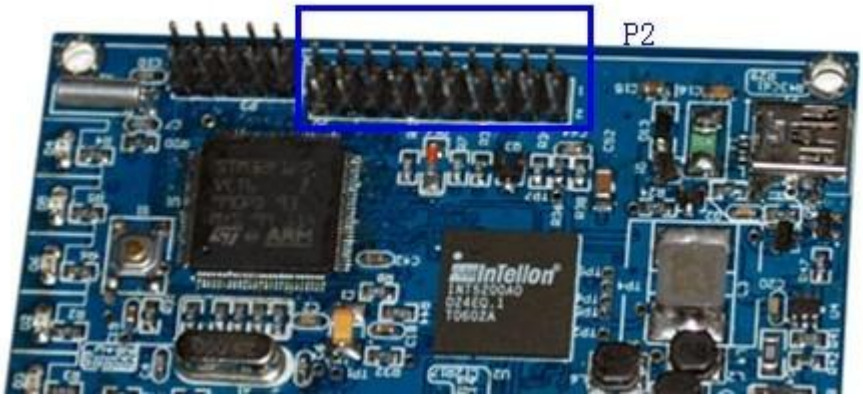
2.1 LED

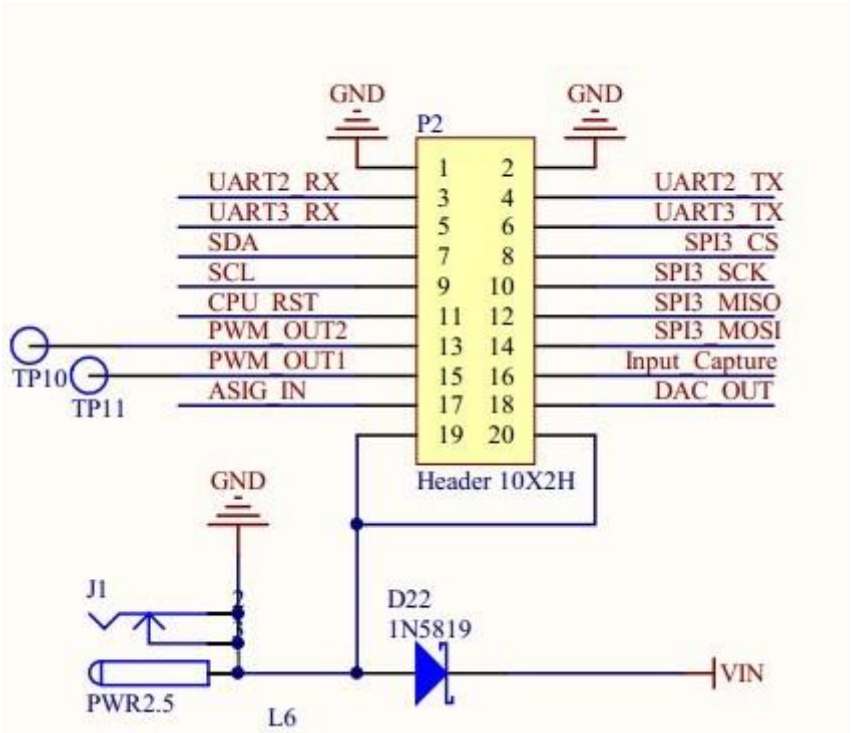
LED1（D1 GREEN）	System status lights, idle time flashing (custom)
LED2（D2 RED）	Data flow indicator (can be customized)
LED3（D3 YELLOW）	(Can be customized)
LED4（D4 GREEN）	ACTIVITY LED
LED5（D5 RED）	COLLISION LED
LED6（D6 YELLOW）	LINK STATUS LED

LED7（D19 RED）	VDD_CPU Power Indicator
LED8（D20 RED）	VDD_1.8DPower Indicator

2.2 Pin Definition

2.2.1 McLaren V2 module pin definition



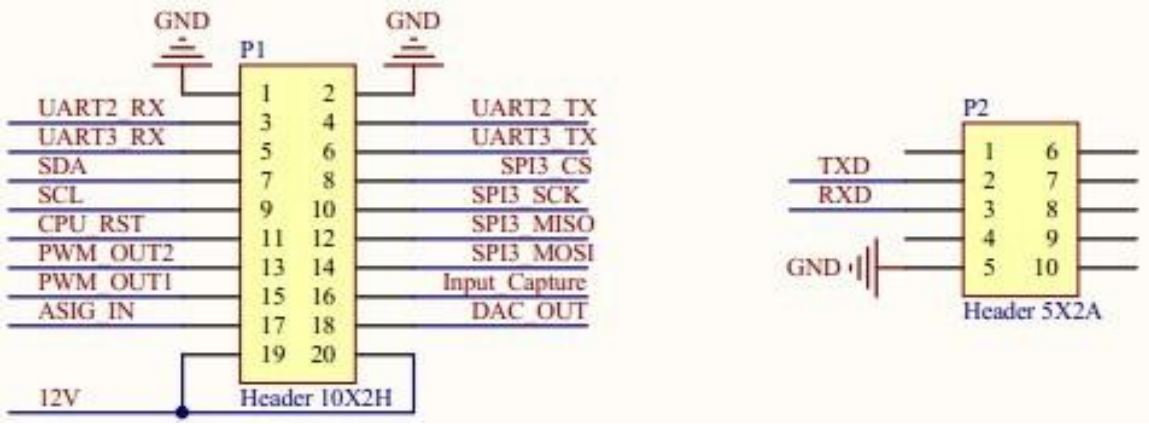


P2：

Pin Definition	Name	Description
1	GND	Ground

2	GND	Ground
3	UART2_RX	UART Data input
4	UART2_TX	UART Data input
5	UART3_RX	UART Data input
6	UART3_TX	UART Data input
7	SDA	IIC data signal
8	SPI3_CS	Master chip select Slave, is select Slave to be Master of the visit
9	SCL	IIC clock signal
10	SPI3_SCK	Master to Slave transmit clock signal
11	CPU_RST	Reset
12	SPI3_MISO	Data inlet, SPI device receives the data.
13	PWM_OUT2	PWM output
14	SPI3_MOSI	Export of data, the SPI device sends data
15	PWM_OUT1	PWM output
16	Input Capture	PWM input capture mode
17	ASIG_IN	-
18	DAC_OUT	Digital-to-analog conversion output
19	Unused	-
20	Unused	-

2.2.2 RS232 child module pin definition

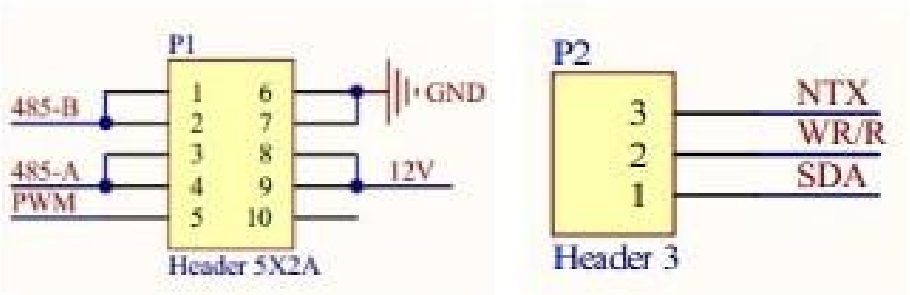


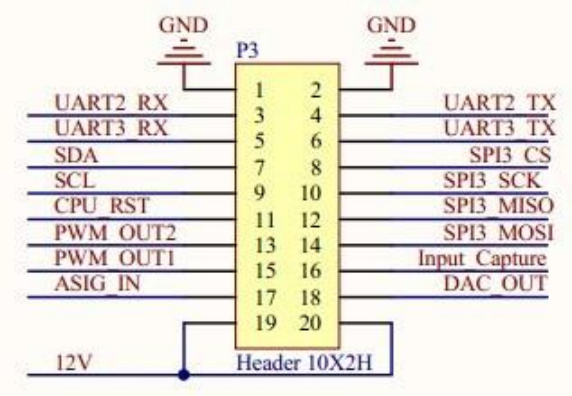
P1：Reference 2.2.1（P1）

P2：

Pin Definition	Name	Description
2	TXD	UART Data input
3	RXD	UART Data input
5	GND	Ground

2.2.3 RS485 child module pin definition





P1：

Pin Definition	Name	Description
1,2	485-B	RS458 D-/B
3,4	485-A	RS485 D+/A
5	PWM	STM32 PWM output
6,7	GND	Ground
8,9	12V	12VPower supply

P2：

Pin Definition	Name	Description
1	SDA	IIC data signal
2	WR/R	Read and write data
3	NTX	UART2 data output

Note: pin1 and pin2 connected for program control; pin2 and pin3 connected to automatic control; under normal working conditions, the use of self-control control (pin2 and pin3 link).

P3: reference 2.2.1 (P1)

The third chapter. AT command set

3.1 Command Mode

3.1.1 Enter the command mode

Through the serial port to send "+ + +" (without the double quotes, plus the Enter key, behind AT command to add the Enter key) the module into command mode, the module will reply "Now module running at AT mode!" enter AT command mode. In order to prevent user data "+ + +" error trigger command mode, the serial port to send "+ + +" seconds before and after the trigger command mode cannot send and receive data. Three "+" between the intervals of not more than 1 second, otherwise, they will be considered as data instead of command.

3.1.2 Exit command mode

Enter the command "ATEX" module will reply "Exited!".

3.2 Parameters and response

3.2.1 Parameters and response

For all the parameters of the command: the parameters of the command with parameters without parameters. If you do not return to the current settings, with parameters related parameters set with parameters. Is returned if successfully set OK, set after the success of the ATSP instructions to save the settings, error if the command input will return "invalid cmd in!" information.

Command without parameters, the module will revert to the existing parameters in the module.

3.2.2 Modify parameters

Modify the parameters, in addition to the serial port parameters are immediately credited to the EEPROM, set after the success of the the ATSP instructions to save the

settings and take effect immediately.

After the revision of the serial port parameters, will not immediately take effect, to prevent users must also be followed to modify the PC serial port parameters can continue to enter commands. Set up after the success of the serial port parameters to use the ATSP instructions to save the settings and exit command mode, automatic restart module to take effect.

3.3 Command list

AT command list:

Instruction	Function	Parameters	Without reference return	Reference sample
ATDA	Query destination address	N	FF-FF-FF-FF-FF-FF	N
ATSA	Query the source address	N	00-22-6C-01-00-01	N
ATBD	Set baud rate	Y	9600	ATBD 9600
ATDB	Set bit of data	Y	8	ATDB 8
ATPA	Set the parity bit	Y	N	ATPA N
ATLP	Set stop bit	Y	1	ATLP 1
ATMA	Return module information	N	LinkSprite's High_Speed_PLC_modem	N
ATRS	Reset system	N	The system will reset!	N
ATEX	Exit the AT command	N	Exited!	N

ATLB	Set the loopback mode	Y	YES NO	ATLB Y ATLB N
ATSP	Save settings	N	Parameter save ok! The system will reset!	N

3.3.1 Use AT commands attention

1) instruction parameters with parameters, without parameters, with no parameters returns the current settings, with parameters relevant parameter settings, setting success is returned OK to use the the ATSP instructions to save the settings set successfully, If the command input error will return "invalid cmd!" information.

2) the back of the module affixed to the product of the source address (MAC address), the destination address is the unified configuration of FF-FF-FF-FF-FF-FF, is a broadcast address.

3) after power module will output "LinkSprite's High_Speed_PLC_modem" These product information, go to the normal data transmission working condition.

4) These systems provide 1200,2400,4800,9600,19200,38400,115200 baud rate can be set, the system provides a maximum baud rate of 115200, available AT commands to system settings.

5) The system can be configured for normal mode and loopback mode, the output of the data in the normal mode, the module can be received through the serial port; while in loopback mode, the module will received data is then sent to the power line, in two modules communications module set to loopback mode, eliminates the need for a serial.

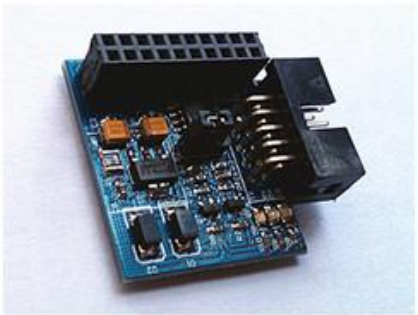
The fourth chapter. Introduces Application

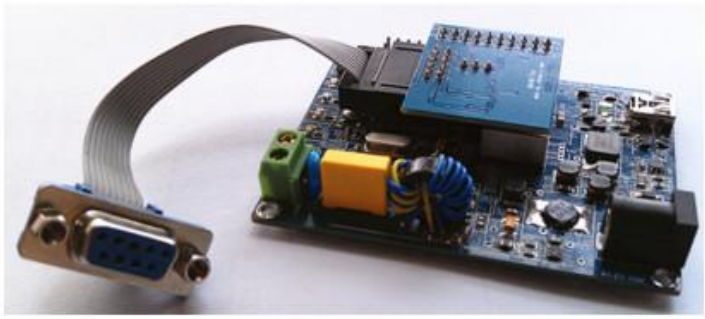
4.1 Mclaren V2 power line carrier module entry

4.1.1 Hardware preparation

1）McLaren V2 module

2）RS232/RS485 adapter module





3）Powerline cable

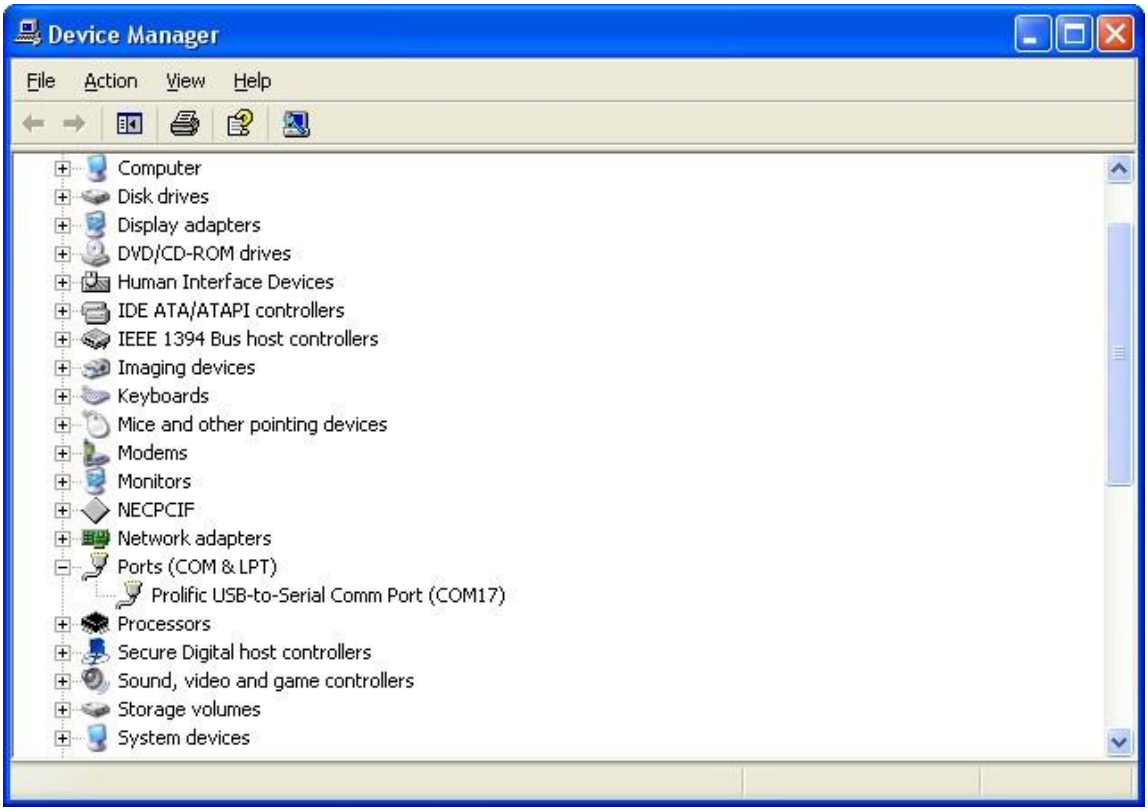
4）Power Adapter: 4.5V to 24V DC, typ 12V/2A DC

Note: multiple McLaren V2 module communication, connection method is the same.

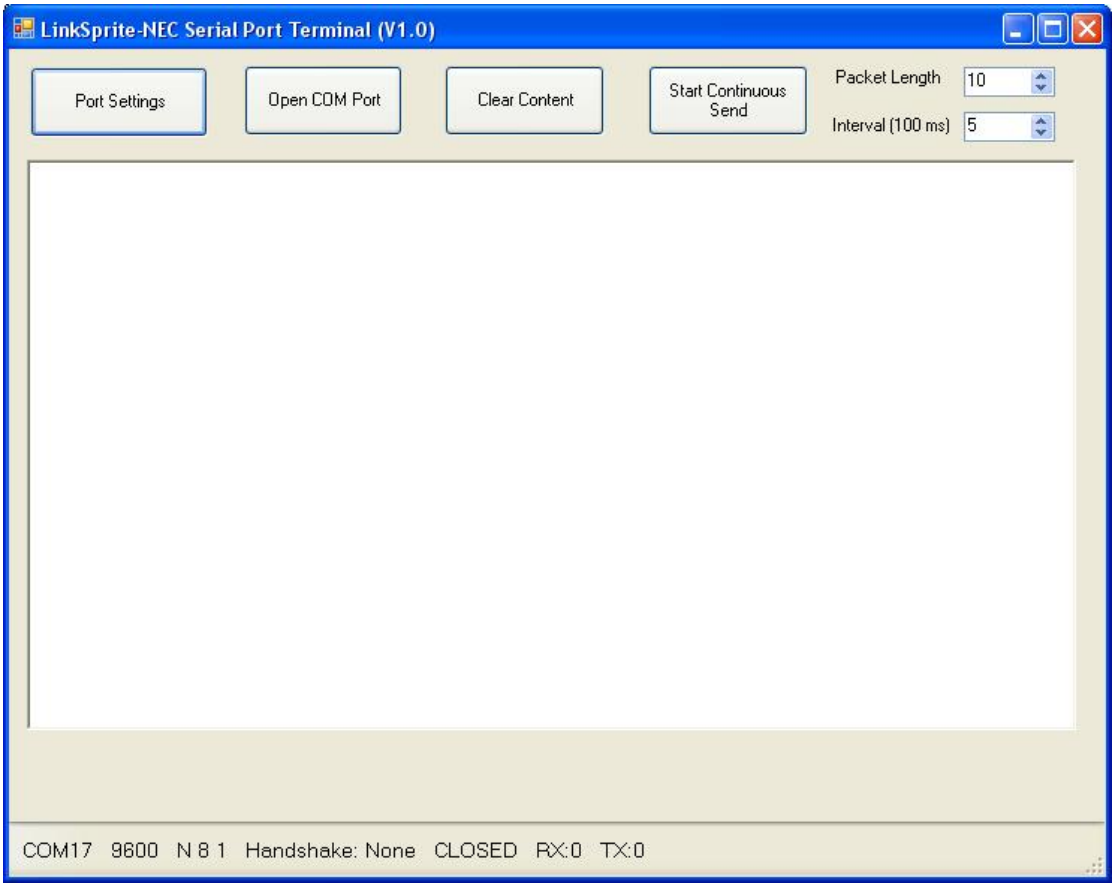
4.1.2 Software to prepare

You need to install a serial port terminal software LinkSprite-NEC, click SETUP.EXE.

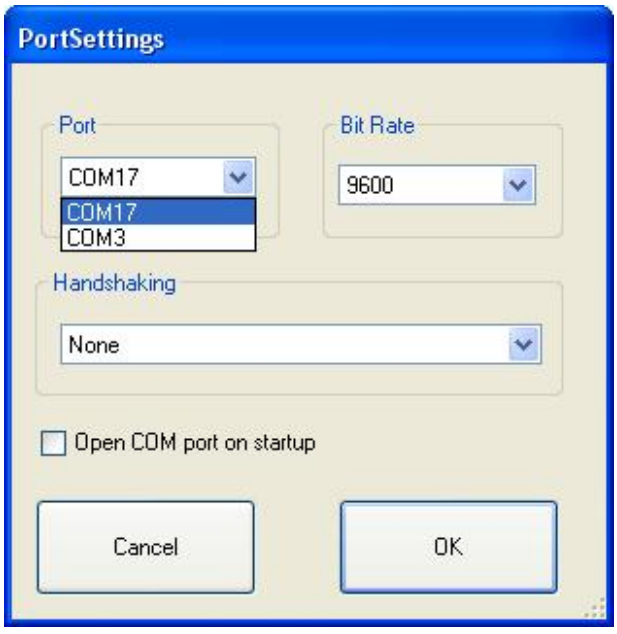
If you are using a USB or RS232 converter, you can find the COM port using the Device Manager tab. In the following figure, it is COM17.



Click Open LinkSprite-NEC serial port terminal, as shown below:



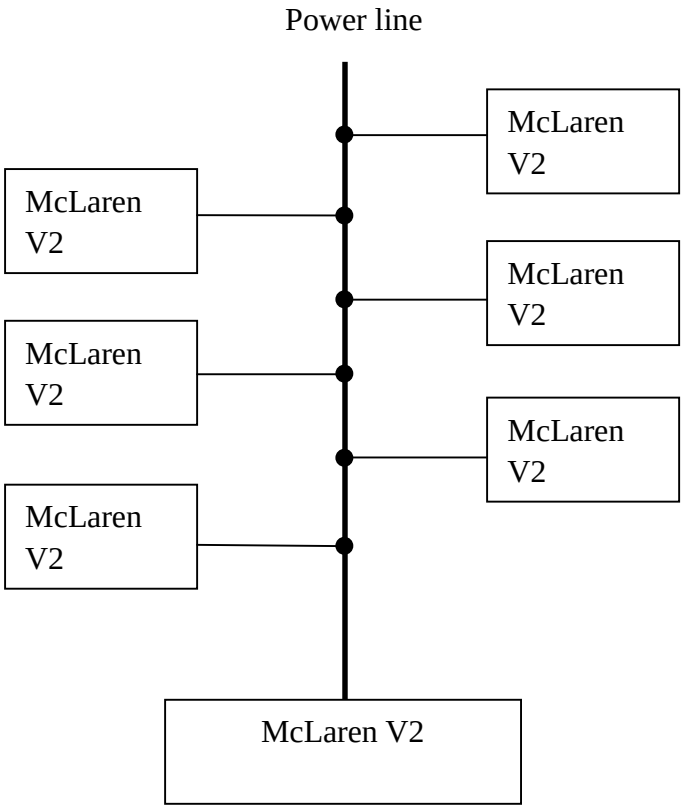
Click on the "port settings" to configure the serial port:



From the "Device Manager", we know, we are using the COM port is COM17. McLaren V2 default baud rate of 9600. Click "OK", and then click "Open COM port

to open COM port.

4.1.3 McLaren V2 module communication paradigm

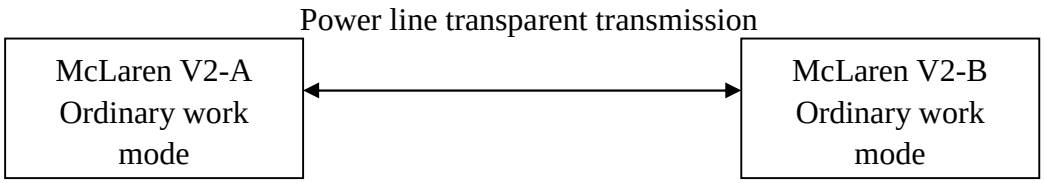


Note: multiple McLaren V2 module communication, each McLaren V2 need to set the same baud rate and connected to a power line.

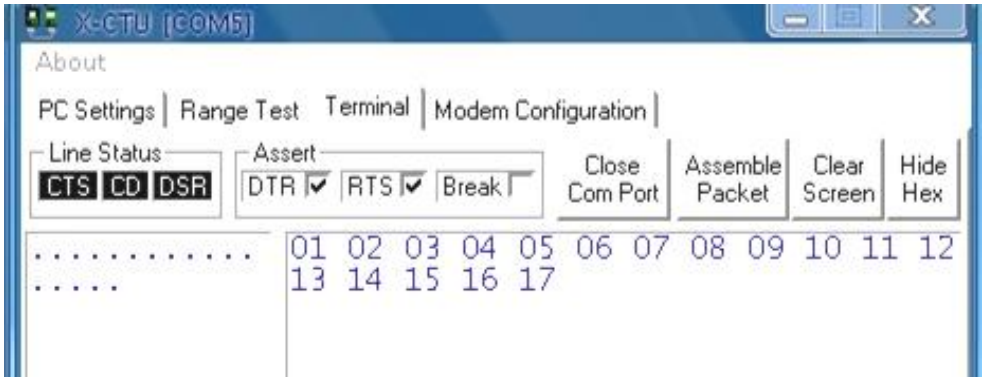
4.2 Operating mode

4.2.1 Normal mode

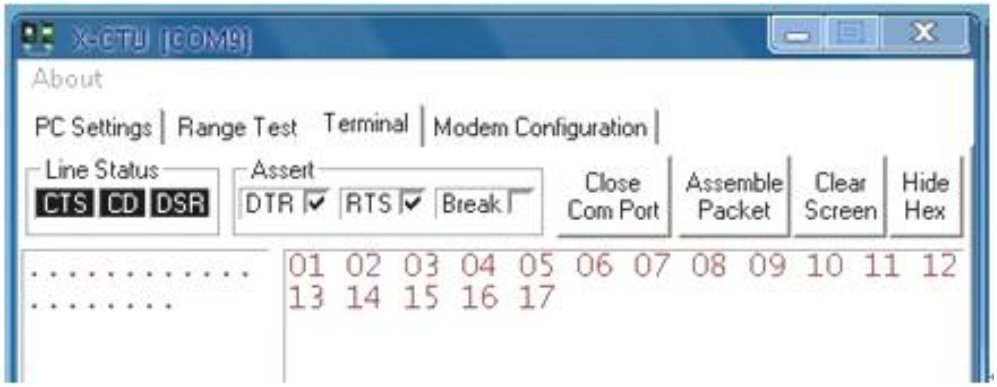
In the normal mode, the module can be received through the serial data output.



McLaren V2-A send data:

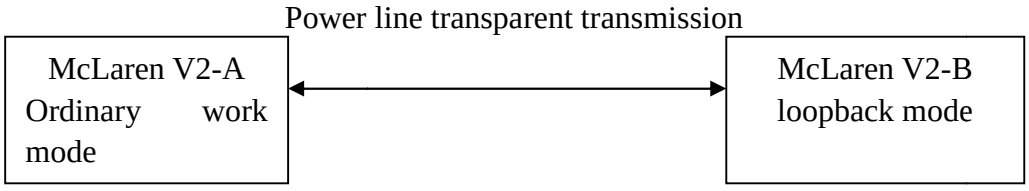


McLaren V2-B receives the data:



4.2.2 loopback mode

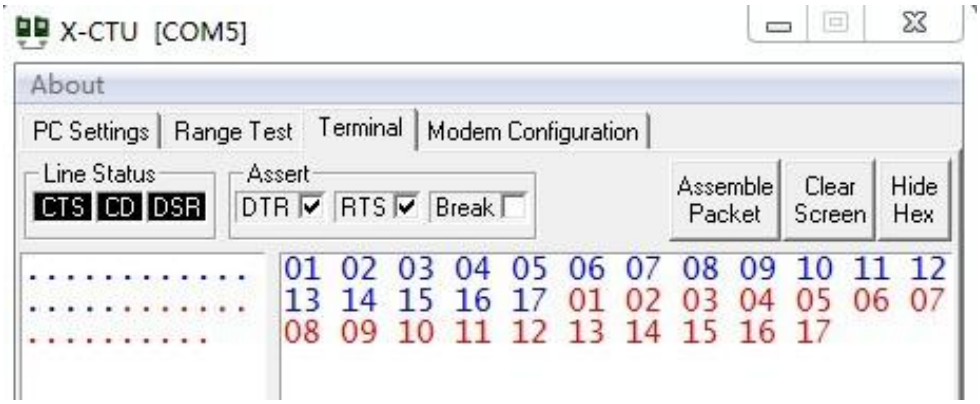
In loopback mode, the module will received data is then sent to the power line, in the case of two modules communicate, a module is set to loopback mode, eliminates the need for a serial.



McLaren V2-A when transmitting data through the transparent transmission of power line, McLaren V2-B can receive data and the received data and then send back

to the power line to this case McLaren V2-A can receive returned McLaren V2-Bdata seen McLaren V2-A and McLaren V2-B communication success. So that through a serial port can be seen McLaren V2 data transmission situation.

McLaren V2-A to send data and receive return data:



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